



# Sustained bilateral middle ear effusions post orthognathic surgery successfully treated with grommet insertion

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## DECLARATIONS

### Competing interests

None declared

### Funding

None declared

### Ethical approval

This article does not contain identifiable patient information but the patient described in the case has given written consent for the report to be published.

### Guarantor

AA

### Contributorship

I declare that the above four authors were the only contributors to the report. AA was the primary contributor with BL, KF and RB being the secondary contributors. RB was the paper supervisor

We present the case of a patient who developed persistent bilateral middle ear effusions post Le Fort I maxillary osteotomy.

## Case report

A 22-year-old woman underwent a Le Fort I maxillary osteotomy to correct a class III malocclusion with maxillary hypoplasia after prior orthodontic treatment. The maxillary movements during the osteotomy consisted of a 4 mm advancement and 2 mm posterior impaction. The surgery was uneventful. Post-operatively, the patient gained an excellent aesthetic and functional result.

Four months post orthognathic surgery, the patient commented on reduced hearing in both ears since her operation. There were no symptoms of otalgia, otorrhoea, tinnitus or vertigo. The patient had no history of prior otological problems and had no medical co-morbidities.

After a two-year period, when the patient was seen in her local otolaryngology department and recommended various treatments (which she declined), she requested a second opinion and was seen in the otolaryngology department of the hospital where her original surgery had been performed.

The patient's auditory symptoms persisted during this time and it was noted that she also suffered from bilateral nasal congestion with hyposmia. On examination, both external auditory canals were healthy. Both tympanic membranes appeared congested suggestive of middle ear effusions. Anterior rhinoscopy revealed a mildly deviated nasal septum to the left but with good airflow bilaterally. Nasendoscopy

revealed rhinitic nasal mucosa without middle meatal pathology and a healthy post nasal space.

Pure tone audiometry (PTA) revealed mild bilateral conductive hearing loss (Figure 1a). Tympanometry revealed bilateral flattened (type B) traces confirming bilateral middle ear effusions. It was decided to proceed with bilateral grommet insertion to improve her middle ear ventilation and hearing. The patient was also commenced on a trial of topical nasal steroids to treat her rhinitis as well as possibly improving her Eustachian tube function.

The patient underwent bilateral grommet insertion under general anaesthetic approximately 30 months after the onset of her auditory symptoms. An antero-inferior myringotomy was performed on both tympanic membranes and thick glue-like fluid was suctioned from both middle ear cavities. *Shah* grommets were then inserted bilaterally. Examination of the post nasal space was unremarkable. The patient was well postoperatively and was discharged with a one-week course of antibiotic/steroid ear drops.

The patient was reviewed back in the otolaryngology clinic six weeks after grommet insertion. Her hearing had improved and this was confirmed on PTA (Figure 1b). On examination, both grommets were noted to be *in situ* and patent. Her nasal congestion was also noted to be improved.

## Discussion

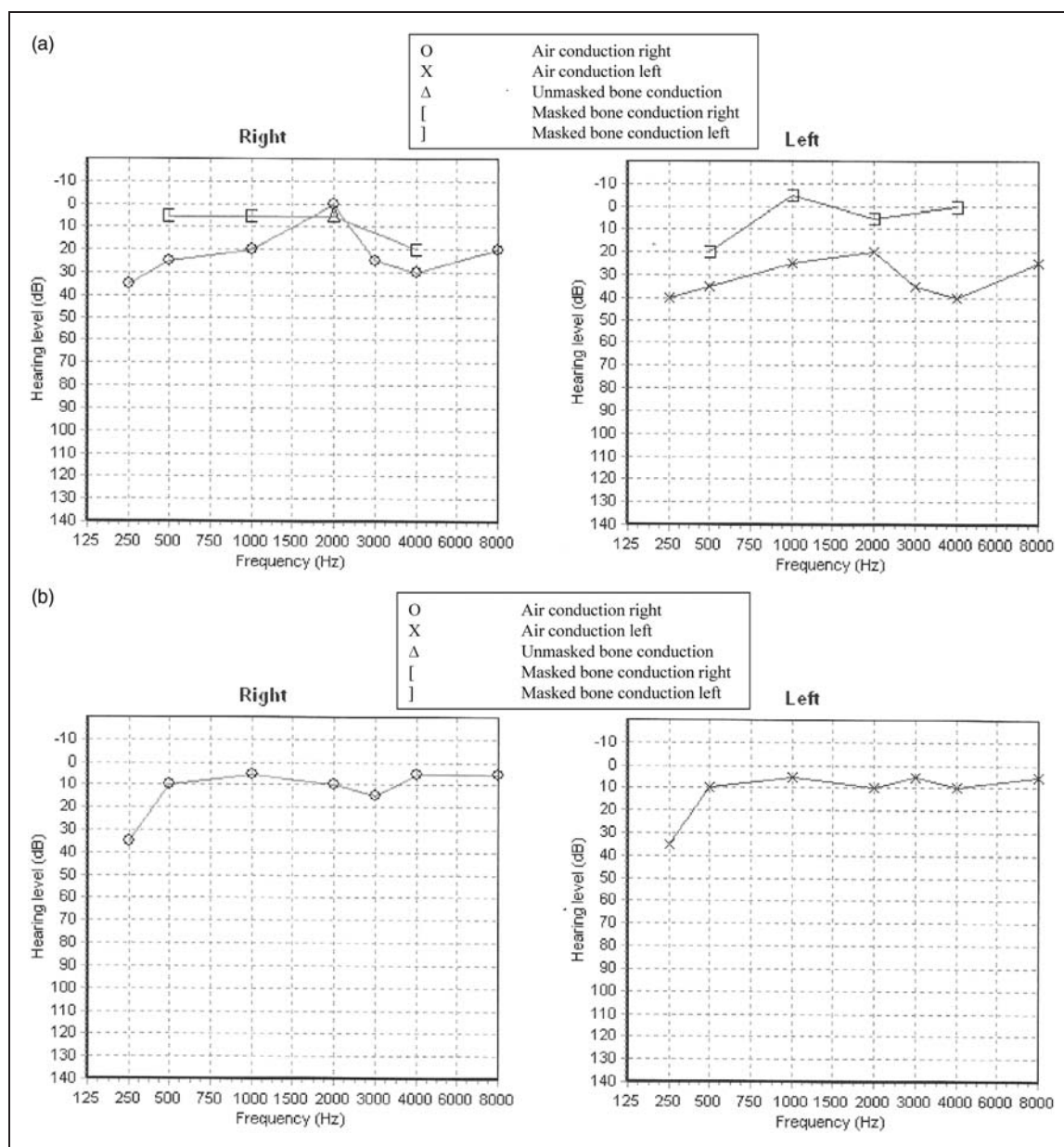
Malocclusion is classically divided into three classes (the Angle classification) on the relative position of the first maxillary molar teeth.

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**Provenance**

Submitted, peer reviewed by Usama Kamel

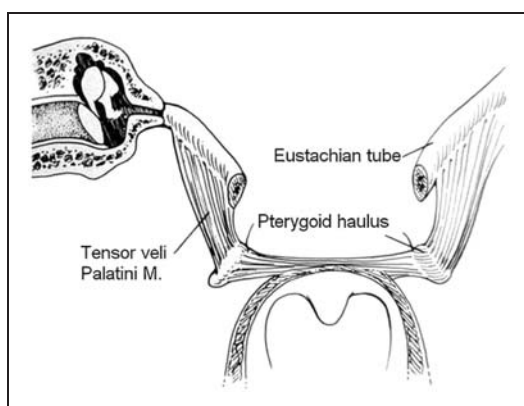


**Figure 1.** (a) Pre-operative PTA. (b) Post-operative PTA.

Class I malocclusion has the normal molar relationship but the other teeth have problems such as spacing or crowding. Class II malocclusion has the lower molar placed posterior to the upper molar. Class III malocclusion has the lower molar placed anterior to the upper molar and this type of malocclusion is often associated with mandibular hyperplasia or maxillary hypoplasia

(as in this case). Orthognathic surgery (post orthodontic treatment) is widely used to correct malocclusion with the aims of improving masticatory function, facial aesthetics and speech.<sup>1,2</sup>

Maxillary osteotomies may be carried out at three levels. The Le Fort I osteotomy employed to correct class III malocclusion involves separating the maxilla and the palate from the skull



**Figure 2.** The relationship between the Eustachian tube and the soft palate.

above the roots of the upper teeth, with the maxilla brought forward and fixed in its new position. Maxillary hypoplasia when seen in other conditions such as cleft palate can also be corrected with a Le Fort I osteotomy.<sup>3</sup>

Middle ear changes post orthognathic surgery have been widely documented.<sup>4</sup> A number of theories have been proposed to explain these changes.

Surgical oedema and haematoma formation as a result of naso-tracheal intubation during orthognathic surgery are thought to cause soft tissue swelling in the nasopharynx. This may lead to blockage of the Eustachian tube precipitating the formation of a middle ear effusion.<sup>1</sup>

Muscle attachments to the Eustachian tube change in direction and tension post maxillary surgery, especially with maxillary advancement.<sup>5</sup> The compliance of the Eustachian tube is dependent mainly on the tensor veli palatini muscle (Figure 2).<sup>5</sup> Decreased ability of this muscle to intermittently open the Eustachian tube (through changes in tension, scarring and changes in orientation of the Eustachian tube) leads to impaired ventilation of the middle ear resulting in negative pressure, middle ear effusion and subsequent conductive hearing loss.<sup>5</sup>

Labyrinthine contusion as a consequence of osteotomy has been suggested as a cause of inner ear damage during orthognathic surgery.<sup>3</sup> Prolonged recumbency in the post-operative period and the noise and vibration of surgery have also been put forward as potential causes

of auditory dysfunction post orthognathic surgery.<sup>5</sup>

Prophylactic high-dose perioperative steroid administration is recommended during orthognathic surgery to reduce post-operative swelling and to provide a certain level of protection against inner ear trauma<sup>3</sup> and was used in this case.

Yaghmaei *et al.*<sup>5</sup> comment that orthognathic surgery can cause auditory system dysfunction but in most cases this is mild and short term and does not require intervention. This is thought to be due to the transient nature of the post-operative oedema, haematoma and changes in the musculature around the Eustachian tube.

Baddour *et al.*<sup>4</sup> also demonstrated tympanometric changes post maxillary osteotomy while Barker<sup>6</sup> demonstrated impaired hearing persisting six to eight weeks after orthognathic surgery. To our knowledge, there are no reports of auditory dysfunction persisting two years after orthognathic surgery.

The reasons for the sustained middle ear changes in this case can be explored further. Persistent post-operative swelling in the nasopharynx is unlikely and can be discounted as examination of the patient's post nasal space on two occasions was completely normal. There may have been continued dysfunction of the musculature around the Eustachian tube and perhaps more significantly the patient's rhinitis may have been contributing to Eustachian tube dysfunction leading to the formation of middle ear effusions.<sup>7</sup>

In this case, the patient was noted to have symptoms and signs of rhinitis but had not been commenced on nasal steroids before the decision on performing grommet insertion had been made. This highlights a shortfall in the management of this patient as the Eustachian tube dysfunction causing the middle ear effusions could have resulted as a consequence of the patient's underlying (untreated) rhino-sinusitis. If the patient's nasal and auditory symptoms had persisted after a sufficient trial of nasal steroids, a computed tomography (CT) scan of the para-nasal sinuses should have been performed to rule out more significant sinus disease.

Grommet insertion to treat conductive hearing loss resulting from middle ear effusions is a common practice and in this case was successful in restoring the patient's hearing. It was important however that the patient's rhinitis was also

treated adequately as without this her auditory symptoms could recur after grommet extrusion.

Vallino<sup>8</sup> recommends the use of PTA to assess hearing before and after all orthognathic surgery and tympanometry when maxillary surgery is being undertaken. This would ensure any post-operative auditory changes would be documented and could be referred to an otolaryngologist if there was persistent auditory dysfunction.

## Conclusion

Middle ear changes post orthognathic surgery (especially maxillary surgery) have been widely documented. This is thought to occur because of soft tissue swelling in the nasopharynx post nasotracheal intubation and also as a result of changes to the musculature around the Eustachian tube post surgery. This auditory dysfunction is usually transient and generally does not require treatment. However, in this case, middle ear effusions were present for more than two years post surgery and may have occurred because of Eustachian tube dysfunction secondary to rhino-sinusitis. The patient's hearing loss was successfully treated with grommet insertion while she also received nasal steroid therapy to treat her rhinitis.

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